

# Chronic bilateral bundle-branch block

## *Long-term observations in ambulatory patients*

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*During a period of 28 months, all patients (79) who presented with bilateral bundle-branch block were selected for study from a private practice outpatient population. They were followed prospectively from the date of entry into the study and their charts were reviewed retrospectively. The average age of the participants was 73.3 years and they were observed clinically for a cumulative period of 4237 months (353.08 years).*

*A high incidence of severe heart disease and death was noted among the study group. Twenty-four (30.3%) had a New York Heart Association functional classification of 3 or 4. Eight (10.1%) died. Only one patient died suddenly and he had had a stable electrocardiographic pattern of bilateral bundle-branch block for a period of 118 months (9 years 10 months). Seven patients required permanent pacemakers. In 6 instances death resulted from pump failure; in one it was the result of lung cancer. In none of these 7 individuals did rhythm disturbances contribute to death. In most cases vertigo was not of cardiac origin (88.2%). Eight patients had 11 major surgical procedures with no significant cardiac sequelae.*

*Our observations suggest that elderly patients with chronic bilateral bundle-branch block should be managed conservatively. The prognosis in these patients appears primarily to be related to the degree of myocardial disease rather than to the conduction disorder.*

In 1968 interest was rekindled in the clinical course of patients manifesting one of the electrocardiographic patterns of bilateral bundle-branch block (Lasser, Haft, and Friedberg, 1968), left axis deviation, and right bundle-branch block. These investigators reviewed 5500 consecutive hospital charts and found a 1 per cent (55 patients) incidence of the pattern of left axis deviation and right bundle-branch block. Of these 55 patients, 9 per cent (5) had third degree atrioventricular block.

Bilateral bundle-branch block is a commonly observed conduction disturbance especially in the elderly, and the electrocardiographic patterns associated with it have been well established (Rosenbaum and Lipeschkin, 1955; Lenegre, 1964; Lipeschkin, 1964; Schloff *et al.*, 1967; Langendorf and Pick, 1968; Rosenbaum, 1968; Watt and Pruitt, 1969; Rosenbaum *et al.*, 1969; Rosenbaum, 1970; Scanlon *et al.*, 1970; New York Heart Association Criteria Committee, 1973). Electrophysiological studies (His bundle recordings) have confirmed the most common site of atrioventricular block to be in the proximal His-Purkinje system (infranodal) (Damato *et al.*, 1969; Schuilenburg and Durrer, 1970; Rosen *et al.*, 1972; Spurrell

*et al.*, 1972; Kunstad *et al.*, 1973). In spite of the recently acquired electrophysiological knowledge of atrioventricular block and usual easy recognition of the electrocardiographic manifestation of bilateral bundle-branch block, the appropriate clinical approach to this large group of patients has not yet been fully clarified. The report presented here is based upon clinical observations of 79 subjects with chronic bilateral bundle-branch block who were selected from a fully ambulatory outpatient population. Its purpose is to help define the prognosis for this patient group and thus aid in arriving at a rational approach to their medical management.

### Patient selection and clinical observations

The subjects for this study were selected from the authors' respective practices. All patients who had the electrocardiographic manifestations of bilateral bundle-branch block as defined by the Criteria Committee of the New York Heart Association and who presented in the office for examination between 1 September 1972 and 31 December 1974 were included in the investigation. Each participant was examined, and if his chart originated in our offices

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it was reviewed retrospectively; previous records from other physicians were excluded. Therefore, in many cases the electrocardiographic patterns of bilateral bundle-branch block may have been present for a significantly longer period of time than has been tabulated. During the entire period of clinical observation each patient was followed by a single physician.

The mean age of our patient population, which consisted of 50 men and 29 women was 73.3 years with a range from 48 to 87 years. The cumulative period of clinical observation amounted to 4237 months (353.08 years), the shortest period of observation was 1 month and the longest 195 months, with a median period of 38 months and a mean of 53.6 months.

A wide spectrum of heart diseases was encountered, the diagnoses being based on accepted clinical criteria and/or the result of cardiac catheterisation. The majority, 68.3 per cent (54 patients), had ischaemic heart disease and 17.7 per cent (14 patients) had hypertension. In the hypertensive group, 6 also had ischaemic heart disease. Cardiomyopathy with normal coronary arteries and impaired ventricular function was detected by cardiac catheterisation in 6.3 per cent (5 patients). Rheumatic heart disease was diagnosed in four patients; three of these also had ischaemic heart disease. Two patients had pulmonary heart disease, one had scleroderma, and in 8.9 per cent (7 patients) the heart disease was of uncertain aetiology.

The New York Heart Association Functional Classification is listed in Table 1 for the 79 patients. Angina was found to be by far the most common symptom, occurring in 67.1 per cent (53 patients). Exertional dyspnoea was noted by 43 per cent (34 patients), palpitation by 24.1 per cent (19 patients), vertigo in 21.5 per cent (17 patients), and syncope in 5.1 per cent (4 patients).

Table 2 contains the frequency of the different electrocardiographic patterns encountered in our series in association with bilateral bundle-branch

Table 1 *New York Heart Association functional classification at end of observation period*

<i>Class</i>	<i>No. of patients</i>	<i>Percentage</i>
1	13	16.5
2	42	53.2
3	16	20.2
4	8	10.1
Total	79	100.0

block. The majority, 83.5 per cent (66 patients), had left axis deviation and right bundle-branch block. The other patterns observed were right axis deviation and right bundle-branch block, and left bundle-branch block superimposed upon right bundle-branch block. Eleven subjects had Q waves suggestive of transmural myocardial infarction; 12 had first degree atrioventricular block; and 6 had chronic atrial fibrillation.

During the 28 months of this investigation, 7 of our patients required permanent pacemakers. Only 4 of these pacemakers were necessitated by atrioventricular block; 2 were required because of sinoatrial dysfunction; and 1 had to be implanted for acute advanced atrioventricular block 20 days after a myocardial infarction. This latter patient died in the hospital 48 hours after the implantation and at necropsy the pacemaker was tested and found to be functioning properly. Three of the four patients who required pacing because of progression of their bilateral bundle-branch block to a higher degree of atrioventricular block presented with syncope and complete atrioventricular block.

Within the period of active observation, 4.5 per cent of the patients with left axis deviation and right bundle-branch block and 8.33 per cent of those with right axis deviation and right bundle-branch block required pacemaker implantation because of the development of second or higher degree atrioventricular block. Though most of the subjects were in

Table 2 *Electrocardiographic observations and associated requirements for pacemaker implantation*

<i>ECG pattern</i>	<i>No. of patients</i>	<i>%</i>	<i>Patients requiring pacemakers</i>			
			<i>No. of patients</i>	<i>%</i>	<i>Observation (mth) before implant</i>	<i>PR (s)</i>
LAD + RBBB	66	83.5	3	4.5	34, 79, 202	0.2 (2 had AF)
RAD + RBBB	12	15.2	1	8.3	15	0.2
LBBB superimposed on RBBB*	1	1.3				
Q waves suggestive of transmural infarction	11	13.9				
1° AV block (PR > 0.20 s)	12	15.2	1	8.3		
Chronic atrial fibrillation	6	7.6	2	33.3		

\*HV interval prolonged 70 ms.

sinus rhythm and had normal PR intervals, of the 4 patients who developed second or higher degree atrioventricular block, 2 had chronic atrial fibrillation and 1 had a prolonged PR interval; only 1 had sinus rhythm with a normal PR interval (Table 2).

Vertigo was a relatively common symptom, occurring in 17 patients (11.8%). In only 2 patients, however, was it of cardiac origin. In contradistinction, of the 4 patients with syncope, 3 (75%) were caused by the conduction defect and usually indicated the onset of a higher degree of atrioventricular block.

Eight patients (10.1%) died during the study period. One of these individuals expired suddenly and represented the only case in which death might conceivably have been ascribed to the sudden onset of atrioventricular block or a rhythm disorder. This sudden death occurred in an asymptomatic 76-year-old man who was known to have had bilateral bundle-branch block for at least 118 months (9 years and 10 months). Six of the other patients who died were functional class 4 and death was the result of their heart disease. These latter patients did not develop any significant rhythm disturbances. One patient died of lung cancer. Table 3 presents the significant data pertaining to the 8 deaths.

Eight of our study participants had 11 major surgical procedures under general anaesthesia. Of these, one patient underwent in separate operations a triple coronary bypass, resection of an aortic aneurysm, and a cholecystectomy. Another patient had a double coronary bypass. One patient each had subtotal gastrectomy for carcinoma, cholecystectomy, suprapubic prostatectomy, hip pinning, and laparotomy. In no instance did a significant rhythm disturbance complicate the intra- or post-operative course.

## Discussion

South Florida has a large geriatric population among whom intraventricular conduction defects are exceedingly common (Burch, 1975). Thus, we had no difficulty in selecting 79 elderly patients with

bilateral bundle-branch block for clinical observation.

Our study confirms two especially important findings previously recorded by others: (1) bilateral bundle-branch block is associated with a high incidence of severe heart disease; and (2) it is uncommon for bilateral bundle-branch block to progress to second or higher degree atrioventricular block (De Pasquale and Bruno, 1973; Dhingra *et al.*, 1974, 1975; Denes *et al.*, 1975). In our series 30.3 per cent (24 subjects) had functional class 3 and 4 heart disease and in 5.1 per cent of cases (4 subjects) second or higher degree atrioventricular block developed.

As noted previously, 8 of our patients died during the 28 months of the study. Of the 8, 6 were classified as functional class 4. Five of the latter died as a result of pump failure without significant associated arrhythmias; the other died in the hospital after a myocardial infarction with a recently implanted properly functioning pacemaker. Lastly, as mentioned above, one patient died of lung cancer and there was one sudden unaccountable death. This was the only subject in our group who might have died from a progression of his bilateral bundle-branch block to higher degree atrioventricular block.

Although seven (8.8%) subjects required pacemakers, only 4 (5.1%) needed pacing because of progression of their atrioventricular conduction disturbance. Of these 4, 3 presented with syncope and slow idioventricular rhythm and one with vertigo and second degree atrioventricular block. In all 4 it was not clinically deleterious that second or higher degree atrioventricular block rather than bilateral bundle-branch block with 1:1 atrioventricular conduction was used as the indication for pacemaker implantation. In all of these subjects the course after pacemaker implantation was uncomplicated.

As expected, in the presence of infranodal atrioventricular conduction defects there was an associated high incidence of supraventricular conduction disturbances (Lev *et al.*, 1974). Twelve (15.2%) subjects had prolonged PR intervals and 6

Table 3 Patient deaths

Cause of death	No. of patients	NY Heart Assoc. Class	Period of observation before death (mth)	Pacemaker
Sudden, unknown	1	1	118	No
Pump failure	5	4	57, 70, 83, 85, and 131	No
Sudden, in hospital 48 hrs after pacer implant*	1	4	103	Yes
Ca lung	1	2	120	No

\*Twenty-two days after acute myocardial infarction.

(7.8%) had chronic atrial fibrillation. It is of interest that of the 4 patients who experienced progression of their infranodal atrioventricular conduction disturbance to a higher degree of atrioventricular block, 2 had chronic atrial fibrillation, 1 had a prolonged PR interval, and 1 had sinus rhythm with a normal PR interval. This suggests that chronic atrial fibrillation in association with bilateral bundle-branch block may be a poor prognostic sign.

This study again confirms that prophylactic pacing is not indicated (Berg and Kotler, 1971) in patients with bilateral bundle-branch block who have to undergo general anaesthesia. Again, as noted above, 8 of our patients were subjected to 11 major surgical procedures without mishap.

Although vertigo and syncope are considered accompaniments of higher degree atrioventricular block, in the elderly they may frequently be the result of non-cardiac disorders (De Pasquale and Bruno, 1973, 1974; Dhingra *et al.*, 1974; Burch, 1975; Denes *et al.*, 1975). In our series only 2 of 17 cases of vertigo were attributable to rhythm disturbances; however, 3 of 4 syncopal episodes were the result of atrioventricular block. In a recent report by Dhingra *et al.* (1974) who also studied patients with chronic bilateral bundle-branch block, most episodes of syncope were not the result of the cardiac disorder. These investigators further noted that in their population of 130 patients syncope did not portend a grave prognosis. Our data tend to confirm this observation but in our group syncope did not occur frequently enough to draw conclusions regarding its prognosis.

His bundle electrography has added a great deal to our knowledge of atrioventricular conduction disturbances. Narula *et al.* (1975) reported data that strongly suggested the incidence of death per year is five times higher in patients with prolonged HV times than in those with normal HV times when the surface electrocardiograms showed the pattern of right bundle-branch block and left anterior hemiblock. They recommended that asymptomatic patients with right bundle-branch block and left anterior hemiblock whose HV times were 70 ms or longer should be considered for permanent pacemaker implantation. Their same study, however, implicated the severity of the heart disease as a main determinant for death when they found that of the 29 patients with prolonged HV intervals who died during the follow-up period 10 had permanent pacemakers. Of the other 19 who did not have pacemakers, 9 died of causes unrelated to atrioventricular block.

In a His bundle electrogram study of 50 patients with bilateral bundle-branch block exhibiting Mobitz II block or transient complete atrioventri-

cular block, Vera *et al.* (1976) recommended that pacemakers be implanted in patients whose HV intervals were 65 ms or longer. Because that was a retrospective series His bundle recordings were undertaken only in the group of patients who had already exhibited high degrees of infranodal atrioventricular block. Dhingra *et al.* (1975) studied 21 patients with long-term right bundle-branch block and left posterior hemiblock and concluded that this pattern was associated with less trifascicular disease than previously reported and that the clinical course of most patients was benign. Wu *et al.* (1976) reported in a study of alternating bundle-branch block that the clinical course was primarily determined by the severity of the heart disease and not by the occurrence of atrioventricular block.

Other reports of His bundle studies in patients with bilateral bundle-branch block have shown that in most cases the results of these studies are not clinically useful in determining which patients with infranodal atrioventricular conduction defects are in danger of progressing to higher degrees of atrioventricular block (De Pasquale and Bruno, 1974; Dhingra *et al.*, 1974; Denes *et al.*, 1975; Rosen *et al.*, 1975). With some exceptions bilateral bundle-branch block is clearly shown by the electrocardiogram (Langendorf, Cohen, and Gozo, 1972), and it appears that for the most part individual prognoses are determined by the severity of the myocardial disease rather than by the conduction disorder (De Pasquale and Bruno, 1973, 1974; Dhingra *et al.*, 1974; Denes *et al.*, 1975; Burch, 1975).

### Clinical implications

Infranodal atrioventricular conduction disorders are not uncommon among senior citizens (Burch, 1975). Our data, together with the findings of others, indicate that the rational medical approach to the problem should be conservative (Burch, 1975; De Pasquale and Bruno, 1973, 1974; Dhingra *et al.*, 1974; Denes *et al.*, 1975; Lev *et al.*, 1974; Rosen *et al.*, 1975). What continues to be needed is appropriate clinical observation including some form of continuous electrocardiographic monitoring when symptoms indicate, as well as prompt therapeutic intervention when second or higher degree atrioventricular block is observed.

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